

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
DC voltage sources: single values	Solid state voltage standard	Direct comparison	10	10	V			1.5	µV	2	95%	No			1
DC voltage sources: single values	Standard cell, solid state voltage standard	Direct comparison	1.018	1.018	V			1.5	µV	2	95%	No			2
DC voltage sources: single values	Solid state voltage standard	Direct comparison	1	1	V			1.5	µV	2	95%	No			3
DC voltage sources: low values	DC voltage source, multifunction calibrator: voltage V	Direct comparison	0.001	2	V			(0.07 + 1.5V), V in V	µV	2	95%	No			300
DC voltage sources: low values	DC voltage source, multifunction calibrator	Direct comparison	2	10	V			0.8	µV/V	2	95%	Yes			302
DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Direct comparison	10	20	V			0.8	µV/V	2	95%	Yes			303
DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Direct comparison	20	1100	V			1.6	µV/V	2	95%	Yes			304
DC voltage meters: intermediate values	DC voltmeter, multimeter, multifunction transfer standard: voltage V	Direct comparison	0	2	V			(0.1 + 2.2V), V in V	µV	2	95%	No			306
DC voltage meters: intermediate values	DC voltmeter, multimeter, multifunction transfer standard	Direct comparison	2	20	V			1.6	µV/V	2	95%	Yes			308
DC voltage meters: intermediate values	DC voltmeter, multimeter, multifunction transfer standard	Direct comparison	20	1100	V			2	µV/V	2	95%	Yes			309
DC resistance standards and sources: low values	Fixed resistor	DCC bridge and range extender	0.0001	0.0001	Ω	Oil bath temperature	23 ( 20 ) °C	0.001	µΩ	2	95%	No			11

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DC resistance standards and sources: low values	Fixed resistor	DCC bridge and range extender	0.001	0.001	Ω	Oil bath temperature	23 ( 20 ) °C	0.003	μΩ	2	95%	No			12
DC resistance standards and sources: low values	Fixed resistor	DCC bridge and range extender	0.01	0.01	Ω	Oil bath temperature	23 ( 20 ) °C	0.02	μΩ	2	95%	No			10
DC resistance standards and sources: low values	Fixed resistor	DCC bridge	0.1	0.1	Ω	Oil bath temperature	23 ( 20 ) °C	0.1	μΩ	2	95%	No			13
DC resistance standards and sources: low values	Resistance box	DCC bridge	0.1	0.1	Ω	Laboratory temperature	23 °C	0.2	mΩ	2	95%	No			15
DC resistance standards and sources: low values	Fixed resistor	DCC bridge	1	1	Ω	Oil bath temperature	23 ( 20 ) °C	0.6	μΩ	2	95%	No			16
DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	10	10	Ω	Oil bath temperature	23 ( 20 ) °C	10	μΩ	2	95%	No			17
DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	25	25	Ω	Oil bath temperature	23 ( 20 ) °C	20	μΩ	2	95%	No			18
DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	100	100	Ω	Oil bath temperature	23 ( 20 ) °C	0.1	mΩ	2	95%	No			19
DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	1000	1000	Ω	Oil bath temperature	23 ( 20 ) °C	1	mΩ	2	95%	No			20

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DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	10	10	kΩ	Oil bath temperature	23 ( 20 ) °C	10	mΩ	2	95%	No			21
DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	100	100	kΩ	Oil bath temperature	23 ( 20 ) °C	0.2	Ω	2	95%	No			22
DC resistance standards and sources: low values	Resistance box	DCC bridge	1	1	Ω	Laboratory temperature	23 °C	0.2	mΩ	2	95%	No			23
DC resistance standards and sources: intermediate values	Resistance box	DCC bridge, digital multimeter	10	10	Ω	Laboratory temperature	23 °C	0.3	mΩ	2	95%	No			24
DC resistance standards and sources: intermediate values	Resistance box	DCC bridge, digital multimeter	100	100	Ω	Laboratory temperature	23 °C	1.5	mΩ	2	95%	No			25
DC resistance standards and sources: intermediate values	Resistance box	DCC bridge, digital multimeter	1	1	kΩ	Laboratory temperature	23 °C	6	mΩ	2	95%	No			26
DC resistance standards and sources: intermediate values	Resistance box	DCC bridge, digital multimeter	10	10	kΩ	Laboratory temperature	23 °C	60	mΩ	2	95%	No			27
DC resistance standards and sources: intermediate values	Resistance box	DCC bridge, digital multimeter	100	100	kΩ	Laboratory temperature	23 °C	0.8	Ω	2	95%	No			28

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DC resistance standards and sources: intermediate values	Resistance box	Digital multimeter	1	1	MΩ	Laboratory temperature	23 °C	12	Ω	2	95%	No			56	
DC resistance standards and sources: intermediate values	Fixed resistor, three terminal resistor	DCC bridge, digital multimeter	1	1	MΩ	Air bath temperature	23 °C	6	Ω	2	95%	No			47	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital multimeter, digital teraohmmeter	10	10	MΩ	Air bath temperature	23 °C	500	Ω	2	95%	No			48	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital multimeter, digital teraohmmeter	100	100	MΩ	Air bath temperature	23 °C	7	kΩ	2	95%	No			49	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital multimeter, digital teraohmmeter	1000	1000	MΩ	Air bath temperature	23 °C	70	kΩ	2	95%	No			50	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital teraohmmeter	10	10	GΩ	Air bath temperature	23 °C	7.0	MΩ	2	95%	No			51	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital teraohmmeter	100	100	GΩ	Air bath temperature	23 °C	140.0	MΩ	2	95%	No			52	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital teraohmmeter	1	1	TΩ	Air bath temperature	23 °C	2.0	GΩ	2	95%	No			53	
DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital teraohmmeter	10	10	TΩ	Air bath temperature	23 °C	50	GΩ	2	95%	No			54	

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DC resistance standards and sources: high values	Fixed resistor, three terminal resistor	Digital teraohmmeter	100	100	TΩ	Air bath temperature	23 °C	2	TΩ	2	95%	No			55
DC resistance standards and sources: high values	Resistance box	Digital multimeter, digital teraohmmeter	10	10	MΩ	Laboratory temperature	23 °C	5	kΩ	2	95%	No			57
DC resistance standards and sources: high values	Resistance box	Digital multimeter, digital teraohmmeter	100	100	MΩ	Laboratory temperature	23 °C	50	kΩ	2	95%	No			46
DC resistance standards and sources: high values	Resistance box	Digital multimeter, digital teraohmmeter	1000	1000	MΩ	Laboratory temperature	23 °C	0.5	MΩ	2	95%	No			58
DC resistance standards and sources: high values	Resistance box	Digital teraohmmeter	10	10	GΩ	Laboratory temperature	23 °C	20	MΩ	2	95%	No			59
DC resistance standards and sources: high values	Resistance box	Digital teraohmmeter	100	100	GΩ	Laboratory temperature	23 °C	0.2	GΩ	2	95%	No			60
DC resistance standards and sources: high values	Resistance box	Digital teraohmmeter	1	1	TΩ	Laboratory temperature	23 °C	10	GΩ	2	95%	No			61
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	1	1	Ω			15	μΩ/Ω	2	95%	Yes			311
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	10	10	Ω			6	μΩ/Ω	2	95%	Yes			312
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	100	100	Ω			4	μΩ/Ω	2	95%	Yes			313

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DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	1	1	kΩ			1.5	μΩ/Ω	2	95%	Yes			314
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	10	10	kΩ			1.5	μΩ/Ω	2	95%	Yes			315
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	100	100	kΩ			3.5	μΩ/Ω	2	95%	Yes			316
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	1	1	MΩ			8	μΩ/Ω	2	95%	Yes			317
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	10	10	MΩ			20	μΩ/Ω	2	95%	Yes			318
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Direct comparison	100	100	MΩ			75	μΩ/Ω	2	95%	Yes			319
DC resistance meters: low values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	1	1	Ω			20	μΩ/Ω	2	95%	Yes			320
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	10	10	Ω			7.7	μΩ/Ω	2	95%	Yes			321
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	100	100	Ω			5.6	μΩ/Ω	2	95%	Yes			322
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	1	1	kΩ			3	μΩ/Ω	2	95%	Yes			323

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DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	10	10	kΩ			2.9	μΩ/Ω	2	95%	Yes			324
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	100	100	kΩ			5.5	μΩ/Ω	2	95%	Yes			325
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	1	1	MΩ			11	μΩ/Ω	2	95%	Yes			326
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	10	10	MΩ			20	μΩ/Ω	2	95%	Yes			327
DC resistance meters: intermediate values	Ohmmeter, multimeter, multifunction transfer standard	Direct measurement	100	100	MΩ			82	μΩ/Ω	2	95%	Yes			328
DC current sources: intermediate values	DC current generator, multifunction calibrator	Drop voltage across the standard resistor	100	200	μA			12	μA/A	2	95%	Yes			329
DC current sources: intermediate values	DC current generator, multifunction calibrator	Drop voltage across the standard resistor	0.2	20	mA			6	μA/A	2	95%	Yes			330
DC current sources: intermediate values	DC current generator, multifunction calibrator	Drop voltage across the standard resistor	20	200	mA			8	μA/A	2	95%	Yes			331
DC current sources: intermediate values	DC current generator, multifunction calibrator	Drop voltage across the standard resistor	0.2	2	A			15	μA/A	2	95%	Yes			332
DC current sources: intermediate values	DC current generator, multifunction calibrator	Drop voltage across the standard resistor	2	20	A			30	μA/A	2	95%	Yes			333

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DC current meters: intermediate values	DC current meter, multimeter, multifunction transfer standard	Direct comparison	100	200	µA			20	µA/A	2	95%	Yes			334
DC current meters: intermediate values	DC current meter, multimeter, multifunction transfer standard	Direct comparison	0.2	20	mA			11	µA/A	2	95%	Yes			335
DC current meters: intermediate values	DC current meter, multimeter, multifunction transfer standard	Direct comparison	20	200	mA			15	µA/A	2	95%	Yes			336
DC current meters: intermediate values	DC current meter, multimeter, multifunction transfer standard	Direct comparison	0.2	2	A			24	µA/A	2	95%	Yes			337
DC current meters: intermediate values	DC current meter, multimeter, multifunction transfer standard	Direct comparison	2	11	A			54	µA/A	2	95%	Yes			338
AC resistance: real component	Fixed resistor	Comparison with AC reference resistor	1	10000	Ω	Frequency	40 Hz to 10 kHz	20	µΩ/Ω	2	95%	Yes			339
Capacitance: low loss capacitors	Fused - silica standard capacitor two terminal pair	Comparison with standard capacitor	10	10	pF	Frequency	1 kHz	1	µF/F	2	95%	Yes			340
Capacitance: low loss capacitors	Fused - silica standard capacitor two terminal pair	Comparison with standard capacitor	100	100	pF	Frequency	1 kHz	1	µF/F	2	95%	Yes			341
Capacitance: low loss capacitors	Standard capacitor two terminal pair	Comparison with standard capacitor	1	10	pF	Frequency	1 kHz	20	µF/F	2	95%	Yes			120
						Dissipation factor	0 to 0.01								
Capacitance: low loss capacitors	Standard capacitor two terminal pair	Comparison with standard capacitor	10	10000	pF	Frequency	1 kHz	10	µF/F	2	95%	Yes			121
						Dissipation factor	0 to 0.01								

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Capacitance: dissipation factor for low loss capacitors	Standard capacitor	Comparison with standard capacitor	1E-06	1		Capacitance	1 pF to 10 nF	3 to 300	1E-06	2	95%	No	<a href="#">matrix D</a>		124
						Frequency	1 kHz								
Capacitance: dielectric capacitors	Standard capacitor two terminal pair	Comparison with standard capacitor	10	1000	nF	Frequency	1 kHz	50	μF/F	2	95%	Yes			122
						Dissipation factor	0 to 0.01								
Capacitance: dielectric capacitors	Standard capacitor four terminal pair	Comparison with standard capacitor	1	10	μF	Frequency	1 kHz	150	μF/F	2	95%	Yes			123
Capacitance: dissipation factor for dielectric capacitors	Standard capacitor	Comparison with standard capacitor	1E-06	1		Capacitance	10 nF to 1000 nF	40 to 400	1E-06	2	95%	No	<a href="#">matrix D</a>		342
						Frequency	1 kHz								
Inductance: self inductance, low values	Standard inductor	Comparison	10	1000	μH	Frequency	1 kHz	500	μH/H	2	95%	Yes			128
Inductance: self inductance, intermediate values	Standard inductor	Comparison	1	1000	mH	Frequency	1 kHz	200	μH/H	2	95%	Yes			129
AC voltage: AC-DC transfer difference at low voltages	Thermal voltage converters with amplifiers, micropotentiometers, AC-DC transfer standard	Comparison	0.002	0.5	V	Frequency	10 Hz to 1 MHz	10 to 370	μV/V	2	95%	Yes	<a href="#">matrix AC-DC V</a>		343
AC voltage: AC-DC transfer difference at medium voltages	Thermal voltage converters, AC-DC transfer standard	Comparison	0.5	5	V	Frequency	10 Hz to 1 MHz	5 to 45	μV/V	2	95%	Yes	<a href="#">matrix AC-DC V</a>		344

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AC voltage: AC-DC transfer difference at higher voltages	Thermal voltage converters with range extenders, AC-DC transfer standard	Comparison	5	1000	V	Frequency	10 Hz to 1 MHz	10 to 100	µV/V	2	95%	Yes	<a href="#">matrix_AC-DC_V</a>		345
AC voltage up to 1000 V: sources	AC voltage source, multifunction calibrator	AC-DC transfer	0.001	1000	V	Frequency	10 Hz to 1 MHz	12 to 600	µV/V	2	95%	Yes	<a href="#">matrix_ACV1</a>		346
AC voltage up to 1000 V: meters	AC voltmeter, multimeter, multifunction transfer standard	Direct comparison	0.001	1100	V	Frequency	10 Hz to 1 MHz	24 to 1100	µV/V	2	95%	Yes	<a href="#">matrix_ACV2</a>		347
AC voltage ratio: real component	Inductive voltage divider	Comparison with reference divider	1E-06	1		Frequency	1 kHz	0.5E-06		2	95%	No			348
						Maximum voltage	50 V								
AC voltage ratio: real component	Inductive voltage divider	Comparison with reference divider	10E-06	1		Frequency	400 Hz to 10 kHz	50E-06		2	95%	No			349
						Maximum voltage	50 V								
AC current up to 100 A: sources	AC current generator, multifunction calibrator	Drop voltage across the standard resistor	0.1	10	mA	Frequency	10 Hz to 10 kHz	65 to 100	µA/A	2	95%	Yes	<a href="#">matrix ACA1</a>		350
AC current up to 100 A: sources	AC current generator, multifunction calibrator	AC/DC transfer	0.01	10	A	Frequency	10 Hz to 10 kHz	65 to 180	µA/A	2	95%	Yes	<a href="#">matrix ACA1</a>		351
AC current up to 100 A: meters	AC ammeter, multimeter, multifunction transfer standard	Direct comparison	1E-04	11	A	Frequency	10 Hz to 5 kHz	75 to 400	µA/A	2	95%	Yes	<a href="#">matrix ACA2</a>		352
AC power and energy: single phase ( $f \leq 400$ Hz)	Power meter, energy meter, power converter, wattmeter, power calibrator	Direct comparison with standard	2.5	30000	W	Voltage	50 V to 300 V	0.1	mW/V A	2	95%	Yes			199

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						Power factor	1 to 0.5, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: three phase	Power meter, energy meter, power converter, wattmeter	Direct comparison with standard	7.5	90000	W	Voltage	50 V to 300 V	0.2	mW/V A	2	95%	Yes			200
						Current	0.05 A to 100 A								
						Power factor	1 to 0.5, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
High DC voltage: high voltage meters	DC kilovoltmeter	Comparison	1	20	kV	Room temperature	23 °C	80	V	2	95%	No			201
High DC voltage: high voltage meters	DC kilovoltmeter	Comparison	20	50	kV	Room temperature	23 °C	350	V	2	95%	No			202
High DC voltage: high voltage meters	DC kilovoltmeter	Comparison	50	100	kV	Room temperature	23 °C	700	V	2	95%	No			203
High voltage impedance: capacitance	HV capacitor	Comparison	10	1E+06	pF	Voltage	up to 2 kV	250	µF/F	2	95%	Yes			204
						Frequency	50 Hz								
High voltage impedance: capacitance	HV capacitor	Comparison	10	1000	pF	Voltage	from 2 kV to 100 kV	250	µF/F	2	95%	Yes			205
						Frequency	50 Hz								
High voltage impedance: capacitance	HV capacitor	Comparison	10	500	pF	Voltage	from 100 kV to 400 kV	250	µF/F	2	95%	Yes			206
						Frequency	50 Hz								
High voltage impedance: capacitance dissipation factor	HV capacitor	Comparison	5E-05	0.1		Voltage	up to 400 kV	3E-05 to 3E-03		2	95%	No			208
						Frequency	50 Hz								

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AC high voltage: ratio error	Standard voltage transformer	Automatic instrument transformer test set	0	20	%	Voltage ratio	100/5 V/V to 1000/250 V/V	0.006 to 0.2	%	2	95%	No			353	
						Frequency	50 Hz									
AC high voltage: ratio error	Standard voltage transformer	Automatic instrument transformer test set	0	20	%	Voltage ratio	1/5 kV/V to 400/250 kV/V	0.006 to 0.2	%	2	95%	No			354	
						Frequency	50 Hz									
AC high voltage: ratio: phase displacement	Standard voltage transformer	Automatic instrument transformer test set	0	20	crad	Voltage ratio	100/5 V/V to 1000/250 V/V	0.006 to 0.2	crad	2	95%	No			212	
						Frequency	50 Hz									
AC high voltage: ratio: phase displacement	Standard voltage transformer	Automatic instrument transformer test set	0	20	crad	Voltage ratio	1/5 kV/V to 400/250 kV/V	0.006 to 0.2	crad	2	95%	No			213	
						Frequency	50 Hz									
AC high current: ratio error	Standard current transformer	Comparison	0	2	%	Current ratio	0.5/5 A/A to 1200/5 A/A	0.002	%	2	95%	No			216	
						Frequency	50 Hz									
AC high current: ratio error	Standard current transformer	Automatic instrument transformer test set	0	20	%	Current ratio	5/1 A/A to 5000/1 A/A and 5/5 A/A to 5000/5 A/A	0.002 to 0.2	%	2	95%	No			217	
						Frequency	50 Hz									
AC high current: ratio error	Standard current transformer	Automatic instrument transformer test set	0	20	%	Current ratio	5000/1 A/A to 40000/1 A/A and 5000/5 A/A to 40000/5 A/A	0.003 to 0.3	%	2	95%	No			218	
						Frequency	50 Hz									
AC high current: ratio: phase displacement	Standard current transformer	Comparison	0	2	crad	Current ratio	0.5/5 A/A to 1200/5 A/A	20	μrad	2	95%	No			219	
						Frequency	50 Hz									

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AC high current: ratio: phase displacement	Standard current transformer	Automatic instrument transformer test set	0	20	crad	Current ratio	5/1 A/A to 5000/1 A/A and 5/5 A/A to 5000/5 A/A	0.002 to 0.2	crad	2	95%	No			220
						Frequency	50 Hz								
AC high current: ratio: phase displacement	Standard current transformer	Automatic instrument transformer test set	0	20	crad	Current ratio	5000/1 A/A to 40000/1 A/A and 5000/5 A/A to 40000/5 A/A	0.003 to 0.3	crad	2	95%	No			221
Phase angle: meters	Phase meter	Direct measurement	0	360	°	Frequency	1 Hz to 100 kHz	0.01 to 0.15	°	2	95%	No	<a href="#">matrix_phase</a>		355
						Voltage	0.25 V to 100 V								
Phase angle: meters	Phase meter	Direct measurement	0	360	°	Frequency	100 kHz to 10 MHz	0.05 to 0.5	°	2	95%	No	<a href="#">matrix_phase</a>		356
						Voltage	0.01 V to 1 V								
Current and voltage waveform: voltage harmonic distortion THD	Generators: total harmonic distortion THD	Direct measurement	0.0005	40	%	Frequency first harmonic	20 Hz to 20 kHz	(5E-06 + 0.1THD), THD in %	%	2	95%	No			357
						Frequency higher harmonic	20 Hz to 500 kHz								
						Voltage	0.1 V to 100 V								
Current and voltage waveform: voltage harmonic distortion THD	Generators: total harmonic distortion THD	Direct measurement	0.0005	40	%	Frequency first harmonic	20 kHz to 100 kHz	(5E-06 + 0.25THD), THD in %	%	2	95%	No			358
						Frequency higher harmonic	20 Hz to 500 kHz								
						Voltage	0.1 V to 100 V								

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Current and voltage waveform: voltage harmonic distortion	THD meters: total harmonic distortion <i>THD</i>	Direct measurement	0.0005	40	%	Frequency first harmonic	20 Hz to 100 kHz	(5E-06 + 3E-03 <i>THD</i> ), <i>THD</i> in %	%	2	95%	No			359
						Frequency higher harmonic	20 Hz to 1 MHz								
						Voltage	1 V to 5 V								
Magnetic fields below 50 kHz: magnetic flux	Fluxmeter	Calibration using magnetic flux standard coil	0.1	100	mWb			10	1E-03	2	95%	Yes			273
Magnetic fields below 50 kHz: magnetic flux	Magnetic flux coil standard	Comparison with magnetic flux standard coil	2	100	mWb	Magnetic flux per unit current	1 mWb/A to 100 mWb/A	1	1E-03	2	95%	Yes			275
Magnetic fields below 50 kHz: DC magnetic flux density	Teslameter	Comparison with solenoid	0.05	100	mT			5	1E-03	2	95%	Yes			224
Magnetic fields below 50 kHz: DC magnetic flux density	Teslameter	NMR methods	0.02	2	T	Homogeneity of magnetic flux density	0 %/cm to 0.01 %/cm	5	1E-03	2	95%	Yes			225
Magnetic fields below 50 kHz: AC magnetic flux density	Teslameter	Comparison using search coil	0.05	10	mT	Frequency	40 Hz to 3000 Hz	10	1E-03	2	95%	Yes			227
Magnetic fields below 50 kHz: DC turn area	Search coil	Comparison using solenoid and magnetic flux standard	0.01	10	Wb/T	Magnetic flux	1 mWb to 100 mWb	2	1E-03	2	95%	Yes			228
Magnetic fields below 50 kHz: turn area	Search coil	Comparison with standard search coil	0.01	1	Wb/T	Frequency	40 Hz to 1000 Hz	5	1E-03	2	95%	Yes			229
Magnetic fields below 50 kHz: magnetic flux density per unit current	Solenoid	Direct comparison with standard solenoid	0.5	10	mT/A	Magnetic flux density	0.5 mT to 10 mT	0.07	1E-03	2	95%	Yes			222

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Magnetic fields below 50 kHz: magnetic flux density per unit current	Solenoid	NMR methods with flowing water	5	50	mT/A	Magnetic flux density	4 mT to 100 mT	0.1	1E-03	2	95%	Yes			223
Magnetic fields below 50 kHz: AC magnetic flux density per unit current	Solenoid	Comparison with standard solenoid	0.05	10	mT/A	Frequency	40 Hz to 5000 Hz	5	1E-03	2	95%	Yes			226
Electromagnetic fields above 50 kHz: electric field strength	Field probe	TEM cell	0.01	140	V/m	Frequency	50 kHz to 250 MHz	0.5 to 1	dB	2	95%	Yes	<a href="#">matrix_HF</a>		230
Electromagnetic fields above 50 kHz: electric field strength	Field probe	Tapered TEM cell	0.01	50	V/m	Frequency	250 MHz to 2500 MHz	1	dB	2	95%	Yes			360
Electromagnetic fields above 50 kHz: electric field strength	Field probe	Waveguide R14, R22: according to IEEE std. C95.3-1991	0.1	200	V/m	Frequency	1000 MHz to 2500 MHz	0.6	dB	2	95%	Yes			361
Electromagnetic fields above 50 kHz: power flux density	Field probe	Waveguide R22: according to IEEE std. C95.3-1991	0.1	10	mW/cm <sup>2</sup>	Frequency	2450 MHz	1	dB	2	95%	Yes			231
RF power: absolute power on coaxial	Power meter, power source	Thermistor sensor and directional coupler or attenuator	0.01	10	mW	Frequency	0.01 GHz to 1 GHz	4	mW/W	2	95%	Yes			232
RF power: absolute power on coaxial	Power meter, power source	Thermistor sensor and directional coupler or attenuator	0.01	10	mW	Frequency	1 GHz to 18 GHz	4 to 7	mW/W	2	95%	Yes			233
					Connector		50 Ω								
					Connector		50 Ω								

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF power: absolute power on coaxial	Power meter, power source	Power sensors and directional coupler or attenuator	0.5E-06	20	W	Frequency	0 GHz to 1 GHz	28 to 35	mW/W	2	95%	Yes	<a href="#">matrix_hf1</a>		234
						Connector	50 Ω								
RF power: absolute power on coaxial	Power meter, power source	Power sensors and directional coupler or attenuator	0.5E-06	20	W	Frequency	0.01 GHz to 18 GHz	28 to 65	mW/W	2	95%	Yes	<a href="#">matrix_hf1</a>		235
						Connector	50 Ω								
RF power: absolute power on waveguide	Power meter, power source	Power sensors and attenuators	0.5E-06	1	W	Frequency	8.2 GHz to 18 GHz	15 to 50	mW/W	2	95%	Yes	<a href="#">matrix_hf2</a>		237
						Connector	R100, R140								
RF power: calibration factor on coaxial	Power sensor	Power sensor NRS and resistive power splitter	0.7	1		Frequency	0 GHz to 0.1 GHz	0.004		2	95%	No			239
						Power level	7 mW								
						Connector	50 Ω								
RF power: calibration factor on coaxial	Thermistor sensor	Thermistor sensor, 1096A Type IV comparator and resistive power splitter	0.7	1		Frequency	0.01 GHz to 1 GHz	0.0098		2	95%	No			240
						Power level	7 mW								
						Connector	50 Ω								
RF power: calibration factor on coaxial	Thermistor sensor	Thermistor sensor, 1096A Type IV comparator and resistive power splitter	0.7	1		Frequency	1 GHz to 10 GHz	0.0065		2	95%	No			241
						Power level	7 mW								
						Connector	50 Ω								
RF power: calibration factor on coaxial	Thermistor sensor	Thermistor sensor, 1096A Type IV comparator and resistive power splitter	0.7	1		Frequency	10 GHz to 18 GHz	0.015		2	95%	No			242
						Power level	7 mW								
						Connector	50 Ω								

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF power: calibration factor on coaxial	Power sensor	Thermistor sensor, 1096A Type IV comparator and resistive power splitter	0.7	1		Frequency	0.01 GHz to 18 GHz	0.02		2	95%	No			243
						Power level	7 mW								
						Connector	50 Ω								
RF power: calibration factor on coaxial	Power sensor	Thermistor sensor and 1096A Type IV comparator	0.7	1		Frequency	0.001 GHz to 1 GHz	0.015		2	95%	No			245
						Power level	7 mW								
						Connector	75 Ω								
RF power: calibration factor on coaxial	Power sensor	NRS power sensor	0.7	1		Frequency	0 GHz to 0.1 GHz	0.009		2	95%	No			246
						Power level	7 mW to 100 mW								
						Connector	75 Ω								
Scalar RF reflection coefficient: on waveguides	Waveguide termination	Waveguide slotted line	0	1		Frequency	26.5 GHz to 40 GHz	0.02		2	95%	No			256
						Connector	R320								
Scalar RF attenuation: on coaxials	Passive device 7 mm (N)	Thermistor sensor, 1096A Type IV comparator and resistive power splitter	0	30	dB	Frequency	0.001 GHz to 18 GHz	0.09	dB	2	95%	No			247
						Connector	50 Ω								
Scalar RF attenuation: on coaxials	Passive device 50 Ω	VM7/8852	0	65	dB	Frequency	0.01 GHz to 18 GHz	0.07	dB	2	95%	No			363
						Connector	50 Ω								
Scalar RF attenuation: on coaxials	Passive device 50 Ω: attenuation A	VM7/8852	65	110	dB	Frequency	0.01 GHz to 18 GHz [7E-02 + 1.1E-02(A - 65)], A in dB		dB	2	95%	No			364
						Connector	50 Ω								

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Scalar RF attenuation: on waveguides	Passive device	Thermistor sensor, 1096A Type IV comparator and directional coupler	0	30	dB	Frequency	8.2 GHz to 40 GHz	0.12	dB	2	95%	No			249
						Connector	R100, R140, R220, R320								
Scalar RF attenuation: on waveguides	Passive device	VM7/8852	0	65	dB	Frequency	8 GHz to 18 GHz	0.07	dB	2	95%	No			365
						Connector	R100, R140								
Scalar RF attenuation: on waveguides	Passive device: attenuation A	VM7/8852	65	110	dB	Frequency	8 GHz to 18 GHz [7E-02 + 1.1E-02(A - 65)], A in dB		dB	2	95%	No			366
						Connector	R100, R140								
Scattering parameters: reflection coefficient (Sii) on coaxials, magnitude	Passive device: magnitude r	Vector network analyser	0	1		Frequency	0.045 GHz to 18 GHz	(0.008 + 0.03r <sup>2</sup> )		2	95%	No		This CMC is related to the next one	250
						Connector	N-type								
Scattering parameters: reflection coefficient (Sii) on coaxial, phase	Passive device: magnitude of reflection coefficient r	Vector network analyser	-180	180	°	Frequency	0.045 GHz to 18 GHz	[0.08f + sin <sup>-1</sup> (0.008/r)], r ranges from the value of the uncertainty of r to 1, f frequency in GHz	°	2	95%	No		This CMC is related to the previous one	251
						Connector	N-type								
Scattering parameters: reflection coefficient (Sii) on coaxials, magnitude	Passive device: magnitude r	Vector network analyser	0	1		Frequency	0.045 GHz to 18 GHz	(0.002 + 0.002r <sup>2</sup> )		2	95%	No		This CMC is related to the next one	252
						Connector	PC-7								

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Scattering parameters: reflection coefficient ( $S_{ii}$ ) on coaxial, phase	Passive device: magnitude of reflection coefficient $r$	Vector network analyser	-180	180	°	Frequency	0.045 GHz to 18 GHz	[ $0.05f + \sin^{-1}(0.002/r)$ ], $r$ ranges from the value of the uncertainty of $r$ to 1, $f$ frequency in GHz	°	2	95%	No		This CMC is related to the previous one	253
Scattering parameters: reflection coefficient ( $S_{ii}$ ) on coaxials, magnitude	Passive device: magnitude $r$	Vector network analyser	0	1		Frequency	0.045 GHz to 26.5 GHz	( $0.004 + 0.004r^2$ )		2	95%	No		This CMC is related to the next one	254
Scattering parameters: reflection coefficient ( $S_{ii}$ ) on coaxial, phase	Passive device: magnitude of reflection coefficient $r$	Vector network analyser	-180	180	°	Frequency	0.045 GHz to 26.5 GHz	[ $0.08f + \sin^{-1}(0.004/r)$ ], $r$ ranges from the value of the uncertainty of $r$ to 1, $f$ frequency in GHz	°	2	95%	No		This CMC is related to the previous one	255
Scattering parameters: transmission coefficient ( $S_{ij}$ ) on coaxials, magnitude	Passive device: magnitude $T$	Vector network analyser	0.0003	1		Frequency	0.045 GHz to 18 GHz	0.00003 to 0.001		2	95%	No		This CMC is related to the next one	367
						Connector	PC-3.5								
						Connector	PC-7								

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty								
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier	
Scattering parameters: transmission coefficient ( $S_{ij}$ ) on coaxial, phase	Passive device: magnitude of transmission coefficient $T$	Vector network analyser	-180	180	°	Frequency	0.045 GHz to 18 GHz	[ $0.5 + \sin^{-1}(u(T)/T)$ ], $u(T)$ uncertainty of the magnitude measurement	°	2	95%	No		This CMC is related to the previous one	368	
Scattering parameters: transmission coefficient ( $S_{ij}$ ) on coaxials, magnitude	Passive device: magnitude $T$	Vector network analyser	0.0003	1		Frequency	0.045 GHz to 18 GHz	0.00003 to 0.001		2	95%	No		This CMC is related to the next one	369	
Scattering parameters: transmission coefficient ( $S_{ij}$ ) on coaxial, phase	Passive device: magnitude of transmission coefficient $T$	Vector network analyser	-180	180	°	Frequency	0.045 GHz to 18 GHz	[ $0.5 + \sin^{-1}(u(T)/T)$ ], $u(T)$ uncertainty of the magnitude measurement	°	2	95%	No		This CMC is related to the previous one	370	
Scattering parameters: transmission coefficient ( $S_{ij}$ ) on coaxials, magnitude	Passive device: magnitude $T$	Vector network analyser	0.0003	1		Frequency	0.045 GHz to 26.5 GHz	0.00003 to 0.001		2	95%	No		This CMC is related to the next one	371	
						Connector	PC-7									
						Connector	PC-7									
						Connector	PC-3.5									

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty								
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier	
Scattering parameters: transmission coefficient ( $S_{ij}$ ) on coaxial, phase	Passive device: magnitude of transmission coefficient $T$	Vector network analyser	-180	180	°	Frequency	0.045 GHz to 26.5 GHz	[0.5 + $\sin^{-1}(u(T)/T)$ ], $u(T)$ uncertainty of the magnitude measurement	°	2	95%	No		This CMC is related to the previous one	372	
Scattering parameters: effective source match	Multiport, splitter	Vector network analyser	0	1		Frequency	0.045 GHz to 18 GHz	0.008 to 0.03		2	95%	No			373	
RF voltage and current: RF voltage sources	HF generator	NRS power sensor	0.2	7	V	Frequency	0 GHz to 0.2 GHz	4	mV/V	2	95%	Yes			257	
RF voltage and current: RF voltage sources	HF generator	Power sensor	0.1	7	V	Frequency	0.001 GHz to 2 GHz	11	mV/V	2	95%	Yes			258	
RF voltage and current: RF voltage meters	HF voltmeter	NRS power sensor	0.2	7	V	Frequency	0 GHz to 0.2 GHz	4.5	mV/V	2	95%	Yes			259	
RF voltage and current: RF voltage meters	HF voltmeter	Power sensor	0.1	7	V	Frequency	0.001 GHz to 2 GHz	15	mV/V	2	95%	Yes			260	
Soft magnetic sheet and powder materials: specific total power loss	Epstein, ring	Wattmeter method	0.2	20	W/kg	Frequency	50 Hz	30	1E-03	2	95%	Yes			261	

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Soft magnetic sheet and powder materials: peak value of AC magnetic polarisation	Epstein, ring	Measurement of mean value of voltage	0.1	1.9	T	Frequency	50 Hz	10	1E-03	2	95%	Yes			262
Soft magnetic sheet and powder materials: peak value of magnetic field strength	Epstein, ring	Measurement of peak value of current	0.03	10	kA/m	Frequency	50 Hz	10	1E-03	2	95%	Yes			263
Soft magnetic sheet and powder materials: RMS value of magnetic field strength	Epstein, ring	Measurement of effective value of current	0.03	10	kA/m	Frequency	50 Hz	10	1E-03	2	95%	Yes			264
Soft magnetic sheet and powder materials: specific apparent power	Epstein, ring	Measurement of effective value of voltage and current	1	100	VA/kg	Frequency	50 Hz	30	1E-03	2	95%	Yes			265
Soft magnetic bulk material: specific saturation magnetisation	Open sample	Comparison with magnetic moment coils	0.2	5	Am <sup>2</sup> /kg	Polarisation	0.3 T to 1.7 T	15	1E-03	2	95%	Yes	The measurand is the saturation magnetisation divided by the density of the material		266

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Hard magnetic material: remanent magnetic flux density	Magnet	Magnetic flux measurement	0.1	1.3	T			15	1E-03	2	95%	Yes			267
Hard magnetic material: coercive field strength ( $H_{CB}$ , $H_{CJ}$ )	Magnet	Special search coils, Hall probes	30	400	kA/m			15	1E-03	2	95%	Yes			268
Hard magnetic material: maximum energy product ( $B \cdot H$ ) <sub>max</sub>	Magnet	Accounting from hysteresis loop	100	500	kJ/m <sup>3</sup>			25	1E-03	2	95%	Yes			269

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

### Uncertainty table: matrix\_D

Capacitance: dissipation factor for low loss capacitors, CMI Internal Identifier: 124

Capacitance: dissipation factor for dielectric capacitors, CMI Internal Identifier: 342

	1 pF to 10 pF	10 pF to 100 pF	100 pF to 1 nF	1 nF to 10 nF	10 nF to 100 nF	100 nF to 1000 nF
1E-06 to 1E-05	3	3	3	10	40	-
1E-05 to 1E-04	3	3	3	10	40	400
1E-04 to 1E-03	3	3	3	10	40	400
1E-03 to 1E-02	5	5	5	10	40	400
1E-02 to 1E-01	30	30	30	30	50	-
1E-01 to 1	300	300	300	300	300	-

The expanded uncertainties given in this table are expressed in  $10^{-6}$

**Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)****Uncertainty table: matrix\_AC-DC\_V**

AC voltage: AC-DC transfer difference at low voltages, CMI Internal Identifier: 343

AC voltage: AC-DC transfer difference at medium voltages, CMI Internal Identifier: 344

AC voltage: AC-DC transfer difference at higher voltages, CMI Internal Identifier: 345

	<b>10 Hz</b>	<b>20 Hz</b>	<b>30 Hz to 300 Hz</b>	<b>400 Hz to 10 kHz</b>	<b>20 kHz to 30 kHz</b>	<b>50 kHz</b>	<b>70 kHz</b>	<b>100 kHz</b>	<b>200 kHz to 300 kHz</b>	<b>500 kHz</b>	<b>700 kHz to 800 kHz</b>	<b>1 MHz</b>
<b>2 mV</b>	250	200	190	190	190	190	190	200	250	270	320	370
<b>6 mV</b>	160	140	110	110	110	110	110	140	180	200	280	320
<b>10 mV</b>	100	95	90	85	90	90	95	100	150	160	240	260
<b>20 mV</b>	90	85	80	80	80	80	80	90	120	140	200	220
<b>60 mV</b>	70	65	60	60	60	60	60	70	80	120	160	170
<b>100 mV</b>	45	35	35	35	35	35	35	40	60	85	110	140
<b>200 mV</b>	35	30	20	20	20	20	20	20	35	60	85	120
<b>300 mV / 500 mV</b>	25	20	10	10	15	15	15	15	20	25	35	45
<b>600 mV / 700 mV</b>	20	15	12	12	12	12	12	12	20	25	35	45
<b>1 V / 2 V</b>	10	8	7	5	6	7	8	8	10	17	30	45
<b>3 V</b>	15	15	12	12	12	12	12	12	20	25	35	40
<b>5 V / 6 V</b>	15	15	12	12	12	12	12	12	20	25	35	45
<b>10 V</b>	15	15	12	10	10	12	12	15	20	25	35	45
<b>20 V</b>	25	25	20	20	20	20	25	30	35	40	45	50
<b>30 V</b>	30	30	25	25	25	25	25	25	35	45	50	60
<b>50 V</b>	40	35	30	30	30	30	35	40	-	-	-	-
<b>60 V</b>	45	45	40	40	40	40	45	45	-	-	-	-
<b>100 V</b>	40	35	30	20	20	25	35	40	-	-	-	-
<b>200 V</b>	50	45	40	40	40	40	50	55	-	-	-	-
<b>300 V</b>	50	45	45	45	45	45	55	60	-	-	-	-
<b>500 V / 600 V</b>	65	50	45	45	45	45	60	65	-	-	-	-
<b>800 V / 1000 V</b>	75	65	55	36	45	60	75	100	-	-	-	-

The expanded uncertainties given in this table are expressed in  $\mu\text{V/V}$

## **Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

### **Uncertainty table: matrix\_ACV1**

AC voltage up to 1000 V: sources, CMI Internal Identifier: 346

	10 Hz	20 Hz	30 Hz / 40 Hz / 55 Hz	300 Hz / 1 kHz	10 kHz	20 kHz / 30 kHz	50 kHz	100 kHz	300 kHz	500 kHz	1 MHz
<b>1 mV</b>	240	220	210	200	200	210	220	240	300	400	600
<b>10 mV</b>	110	100	95	90	95	100	110	120	180	240	500
<b>100 mV</b>	70	60	55	50	50	55	60	80	100	200	420
<b>1 V</b>	25	20	20	12	12	15	20	25	40	90	300
<b>10 V</b>	30	20	20	15	15	18	23	26	50	100	320
<b>100V</b>	45	40	35	25	25	25	30	50	-	-	-
<b>700 V</b>	-	-	-	-	-	-	60	100	-	-	-
<b>1000 V</b>	-	-	60	45	50	60	-	-	-	-	-

The expanded uncertainties given in this table are expressed in  $\mu\text{V/V}$

## **Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

### **Uncertainty table: matrix\_ACV2**

AC voltage up to 1000 V: meters, CMI Internal Identifier: 347

	10 Hz / 20 Hz / 30 Hz	40 Hz / 55 Hz	300 Hz / 1 kHz	10 kHz	20 kHz	30 kHz / 50 kHz	30 kHz / 50 kHz	100 kHz	300 kHz	500 kHz	1 MHz
<b>1 mV to 2 mV</b>	280	280	260	280	290	390	390	620	750	770	1100
<b>2 mV to 20 mV</b>	160	160	140	160	170	240	240	400	580	610	950
<b>20 mV to 200 mV</b>	120	120	90	100	120	190	190	360	580	610	950
<b>0.2 V to 2 V</b>	36	24	24	24	24	24	31	37	96	200	560
<b>2 V to 20 V</b>	36	24	24	24	26	26	26	35	83	180	530
<b>20 V to 200 V</b>	50	40	29	29	35	29	35	64	-	-	-
<b>200 V to 700 V</b>	-	70	55	60	74	74	110	350	-	-	-
<b>700 V to 1100 V</b>	-	70	55	60	74	74	-	-	-	-	-

The expanded uncertainties given in this table are expressed in  $\mu\text{V/V}$

**Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

**Uncertainty table: matrix\_ACA1**

AC current up to 100 A: sources, CMI Internal Identifiers: 350 and 351

	10 Hz	20 Hz / 30 Hz	40 Hz / 55 Hz / 300 Hz / 1 kHz	5 kHz	10 kHz
100 µA	100	90	70	70	80
1 mA	100	90	70	70	80
10 mA	90	75	65	70	70
100 mA	80	65	65	70	80
1 A	120	100	90	100	120
10 A	180	160	110	140	160

The expanded uncertainties given in this table are expressed in µA/A

**Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

**Uncertainty table: matrix\_ACA2**

AC current up to 100 A: meters, CMI Internal Identifier: 352

	10 Hz	300 Hz	1 kHz	5 kHz
<b>100 µA to 200 µA</b>	130	100	100	160
<b>0.2 mA to 2 mA</b>	120	90	90	140
<b>2 mA to 20 mA</b>	120	75	75	130
<b>20 mA to 200 mA</b>	120	75	75	130
<b>0.2 A to 2 A</b>	170	120	120	220
<b>2 A to 11 A</b>	310	280	280	400

The expanded uncertainties given in this table are expressed in µA/A

## Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)

### Uncertainty table: matrix\_phase

Phase angle: meters, CMI Internal Identifiers: 355 and 356

	$U_1 = U_2$	$U_2/U_1 \leq 100$
1 Hz to 1 kHz	0.01	0.02
1 kHz to 6 kHz	0.01	0.1
6 kHz to 50 kHz	0.03	0.13
50 kHz to 100 kHz	0.05	0.15
100 kHz to 1 MHz	0.05	0.15
1 MHz to 10 MHz	0.1	0.5

$U_1$  and  $U_2$  are the signals whose phase difference is measured

The expanded uncertainties given in this table are expressed in °

**Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

**Uncertainty table: matrix\_HF**

Electromagnetic fields above 50 kHz: electric field strength, CMI Internal Identifier: 230

	50 kHz to 20 MHz	20 MHz to 200 MHz	200 MHz to 250 MHz
0.01 V/m to 14 V/m	0.5	0.5	1
14 V/m to 140 V/m	-	0.5	1

The expanded uncertainties given in this table are expressed in dB

**Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

**Uncertainty table: matrix\_hf1**

RF power: absolute power on coaxial, CMI Internal Identifiers: 234 and 235

	DC to 0.01 GHz	0.01 GHz to 1 GHz	1 GHz to 4 GHz	4 GHz to 8 GHz	8 GHz to 12 GHz	12 GHz to 18 GHz
<b>5E-07 W to 1E-03 W</b>	-	28	27	31	36	45
<b>1E-03 W to 1E-01 W</b>	35	28	28	28	33	45
<b>1E-01 W to 1 W</b>	28	28	28	36	41	50
<b>1 W to 20 W</b>	30	28	31	37	48	65

The expanded uncertainties given in this table are expressed in mW/W

**Electricity and Magnetism, Czech Republic, CMI (Czech Metrology Institute)**

**Uncertainty table: matrix\_hf2**

RF power: absolute power on waveguide, CMI Internal Identifier: 237

	8.2 GHz to 12 GHz	12 GHz to 18 GHz
5E-07 W to 1E-04 W	25	35
1E-04 W to 1E-02 W	15	17
1E-02 W to 1 W	40	50

The expanded uncertainties given in this table are expressed in mW/W